Evaluation of Traditional Fishing Crafts and Gears in the Janjhavati Reservoir: Recommendations for Sustainable Fisheries

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ABSTRACT:
Fishing gears exhibit significant variation in structure, materials, capture mechanisms, and operational methods. In recent decades, the design and development of harvesting systems have advanced through studies in fish behavior, engineering, system analysis, and modeling. The introduction and widespread use of synthetic materials, improvements in vessel technology, navigational electronics, gear-handling equipment, fish detection techniques, and behavioral research have collectively transformed modern fishing gears such as trawls, purse seines, and longlines—enhancing their design, fabrication, efficiency, and catch capacity. Traditional fishing gears—such as entangling nets, hooks and lines, and traps—have also evolved, benefiting from design upgrades and improved operational efficiency. In recent years, the gear design process has been increasingly shaped by considerations of resource management, environmental conservation, and energy efficiency.

Keywords: Vessel technology, Navigational electronics, Gear-handling machinery, Fish detection methods, Traditional fishing gears, Entangling nets, Environmental sustainability.

1.Introduction:

The choice and design of fishing gear are significantly influenced by various biological characteristics of the target species, such as body size and shape, feeding habits, swimming speed, and behavior near fishing gear during the capture process. Additionally, spatial distribution and aggregation patterns of fish play a critical role in gear selection and effectiveness.
Body size and shape are key determinants for selecting appropriate mesh sizes in gill nets, as well as for retaining target size groups in trawls, seines, and traps without causing gilling or escape. Swimming speed becomes particularly important in active fishing methods like trawling, seining, and trolling, where gear must match or outpace the mobility of the target species.
Behavioural and size differences between fish and crustaceans also provide opportunities for selective gear design. For instance, trawl designs incorporating rigid grids angled before the codend can effectively separate species based on swimming behavior and morphology, thereby enhancing selectivity and reducing bycatch.
Furthermore, the spatial distribution of fish affects gear choice: some species are sparsely distributed, either singly or in small groups, resulting in pronounced patchiness. These are more efficiently targeted using passive fishing methods such as gill netting and longlining. In contrast, species that form dense schools are more effectively harvested using active methods like purse seining and aimed midwater trawling.

2. Materials and Methods:

A. Study Area Description

The Janjhavati Reservoir is a significant irrigation project located in Rajyalakshmipuram village of Komarada Mandal, Parvathipuram Manyam District, Andhra Pradesh. It was constructed on the Nagavali River, a tributary of the Vamsadhara. This reservoir is notable for housing India's first rubber dam—an innovative structure inaugurated on January 1, 2006, by the then Chief Minister of Andhra Pradesh, Dr. Y.S. Rajasekhara Reddy. Despite its engineering significance, the reservoir has faced challenges including unresolved land acquisition issues and an ongoing inter-state dispute with Odisha.

B. Temporal Scope and Sampling Period

The present investigation was conducted over a full year—from June 2024 to May 2025. This extended duration allowed for comprehensive data collection across seasonal variations in fishing practices and catch composition.

C. Sampling Zones and Field Sites

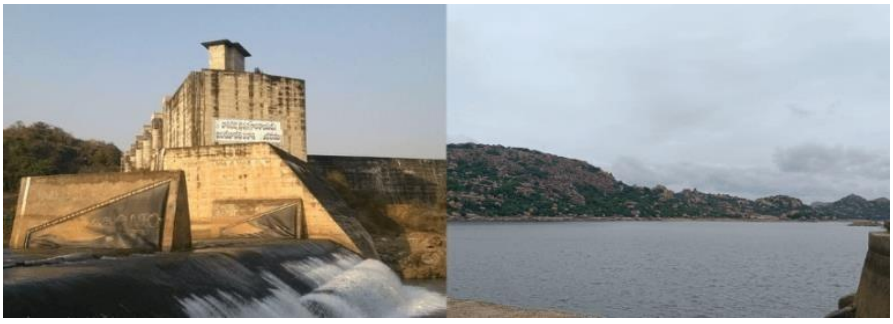
The study covered the entire stretch of the dam area, incorporating the three major ecological
zones of the reservoir:
Lotic Zone: Areas with flowing water near inlets and outlets
Intermediate Zone: Transitional areas between flowing and still waters
Lentic Zone: Stagnant or still water areas typically away from inflows/outflows
Each zone was visited monthly to ensure accurate and representative data collection across all habitat types.

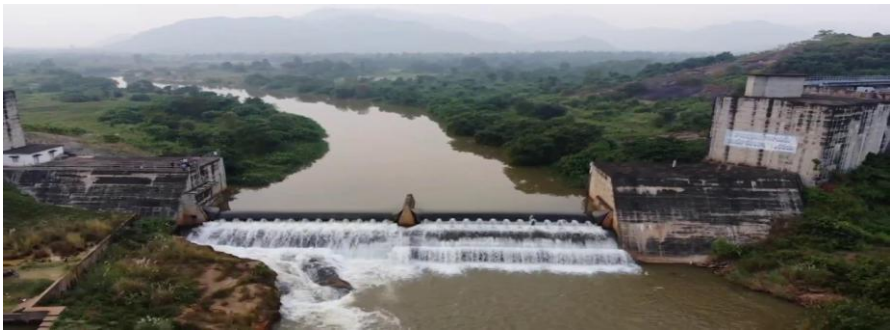
D. Data Collection Techniques
Field data were gathered through personal visits to various fish landing sites across the reservoir. Each visit involved:
- Observations of daily fishing activities
- Interactions with local fishers and community members
- Visual documentation and photography of fishing methods and gears
- This hands-on approach ensured data accuracy and contextual understanding of traditional fishing practices.

E. Survey Instrument and Interview Schedule
A structured questionnaire was developed to systematically document fishing gear and craft usage.
The questionnaire collected detailed information under the following categories:
- Local name of the gear or craft
- Materials used for construction
- Number of persons involved in operation
- Mesh size and other technical specifications
- Method of operation
- Season of usage
- Approximate cost
- Lifespan of gear
- Target species typically caught

F. Field Measurement and Equipment Documentation
All crafts and gears encountered during the survey were physically measured and recorded on-site.
These measurements included:
- Length, breadth, and depth of boats or rafts
- Mesh sizes and dimensions of nets
- Frame and handle sizes of traps and lines

The collected data were then categorized based on design, gear type, operational zone, and target species.Measurements of fishing crafts and gears were taken directly in the field and documented accordingly.





Study area: Jhanjhavathi Reservoir.

3. Results and Discussion:
During the survey of the fisherman population, the number and types of fishing crafts and gears
have been carried out along with the fishing techniques used by the fisher folks in the river, paddy field under paddy - cum pisciculture, swampy area which could be utilized by excavation/ impounding damming etc. of an area of about 24,640 hectares, about 45 fishermen used different types of fishing crafts and gears including a number of indigenous fishing techniques. These fisher folks who maintain a subsistence economy still resort to their primitive and traditional

fishing crafts and gears. The only crafts they used in the dug - out wooden canoe, and a very few planks build canoe (Table).

The various gears include wounding spears, pole and line, gorges, hooks, traps, nets (mostly small) etc. Groping and stranding which are very primitive techniques of fishing are also used till today. Therefore, their fishing activity is so low that when there is a resource potential of fishing not less than 1,000 tonnes per year of fish from these water bodies. These fisher folks are sinking more and more in their drudgery of working with primitive tolls and techniques. The first and the foremost step in this regard is modernization of fishing gears and crafts through scientific intervention.

DATA SHEET FOR GEARS & GILL NETS (Table)

Sl. No.	Type of gear	Length	Width	Mesh size	Material used	Longevity of the gear	Mode of operation	Type of craft used
1)	Gill net	60 metres	4ft	20 mm	Polyamide (PA)	3 to 4 years	Released from the Canoe	Dugout canoes & Plank build canoe
2)	Gill net	90 metres	4 ft	25 mm	Polyamide (PA)	3 to 4 years	Released from the Canoe	Dugout canoes & Plank build canoe
3)	Gill net	60 metres	4ft	35 mm	Polyamide (PA)	3 to 4 years	Released from the Canoe	Dugout canoes & Plank build canoe
4)	Gill net	60 -90 metres	5ft	50 - 60 mm	Nylon	3 to 4 years	Released from the Canoe	Dugout canoes & Plank build canoe
5)	Gill net	60 metres	7 to 8 ft	70 - 90 mm	Nylon	2 to 3 years	Released from the Canoe	Dugout canoes & Plank build canoe
6)	Gill net	60 metres	8 to 10ft	100 – 120 mm	Nylon	2 to 3 years	Released from the Canoe	Dugout canoes & Plank build canoe

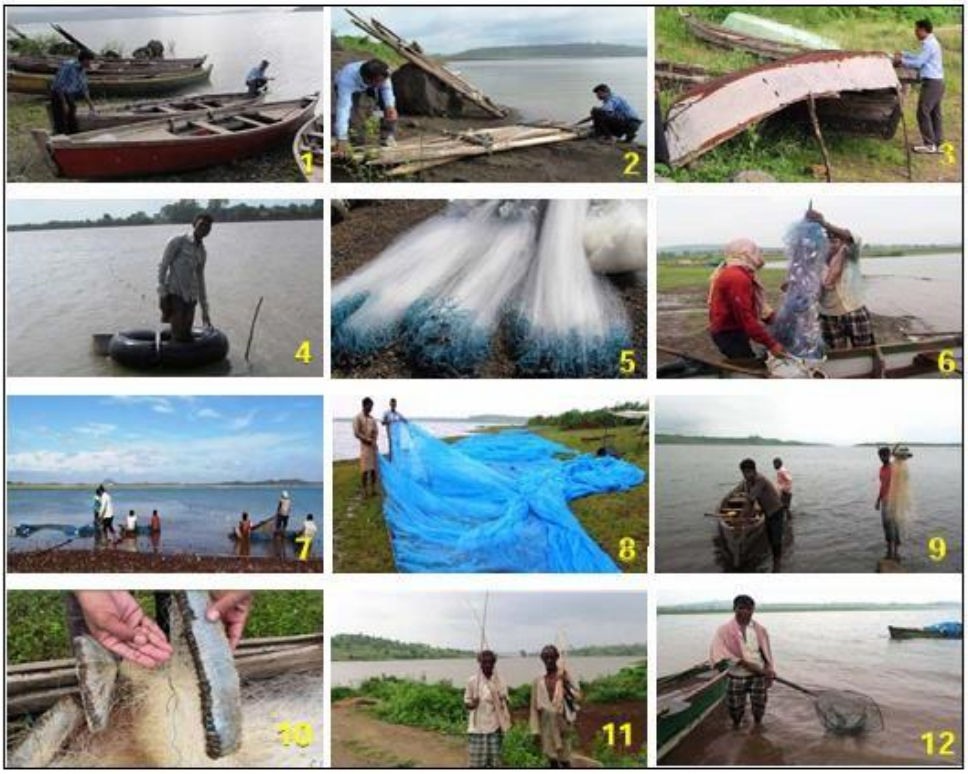


Fig 1: Plank-built boat; **Fig 2:** Catamaran; **Fig 3:** Tin made boat; **Fig 4:** Rubber tube platform; **Fig 5:** Gill nets; **Fig 6:** Fishes harvested by gill nets; **Fig 7:** Mahajal in operation; **Fig 8:** Mahajal; **Fig 9:** Hooks and lines ready to operate; **Fig 10:** Hooks with lines; **Fig 11:** Pole and lines; **Fig 12:** Hand net

4. Conclusion:

The Janjhavati Reservoir, an important irrigation project in Andhra Pradesh, has undergone significant ecological changes that have also impacted its fisheries. Despite the reservoir's potential to support a productive capture fishery, the fishing community continues to rely on outdated, traditional fishing crafts and gears. These methods are inefficient and limit the economic viability of fishing as a livelihood.

The lack of access to modern equipment, compounded by the absence of local manufacturing facilities and organized scientific support, has left fishermen dependent on smuggled nylon nets and primitive tools. As a result, the full fishery potential—estimated at not less than 1,000 tonnes annually— remains largely untapped.

To improve fishery productivity, protect the environment, and uplift the livelihoods of local fisherfolk, targeted modernization and management interventions are urgently needed.

5. Recommendations:

A. Modernization of Fishing Crafts and Gears

(a) Fishing Crafts

- Develop suitable sealing materials and water-resistant paints for plank-built canoes.
- Design attachments for improved canoe stability and safety.
- Introduce FRP (Fibre-Reinforced Plastic) boats on a pilot scale.
- Develop a prototype fishing canoe customized for local water conditions.

(b) Fishing Gears

- Trial medium-sized purse seines for phoom (shoal-based) fishing.
- Introduce lantern nets, collapsible box traps, light fishing, and prawn-specific fishing gears. Conduct trials of surface and mid-water trawls in the Barrak River system.
- Explore electric fishing using dry-cell DC currents, especially in hill streams (with ecological safeguards).

B. Environmental Conservation

- Reduce the cutting of large trees for canoe construction.
- Discourage the use of pesticides in capture fisheries to protect aquatic biodiversity.

C. Livelihood and Economic Development

 Promote the socio-economic development of fishing communities through sustainable practices and improved access to technology and markets.

D. Training and Capacity Building

 Organize regular training programs for fishermen in the use, maintenance, and sustainability of modern fishing technologies.

E. Research and Monitoring

- Establish a research laboratory for:
- Ongoing ecological monitoring
- Gear innovation testing

5.Acknowledgement

The authors wish to thank Biological Laboratory, Department of Zoology, Andhra University Visakhapatnam for Provided necessary laboratory facilities during this entire work.

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